Stephen's Healthy Housing Column

Time to Look at Your Home in a Different Light: Basements, Part 1

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Stephen Collette is a Certified Building Biology Environmental Consultant (BBEC). This lengthy certification analyses the built environment and how it impacts people's health. Stephen was a natural builder for 5 years specializing in straw bale construction. Stephen has an engineering background and training which enables him to understand the various processes occurring within the home and how they can interact. Applying these skills and knowledge to the standard home and small office enables Your Healthy House to find the reasons for poor indoor air quality and to create solutions to help create your healthy house.

Stephen Collette is a Leadership in Energy and Environmental Design - Accredited Professional (LEED AP), which allows Stephen to use the Canada Green Building Council's guidelines and method to ensure a quantitative approach to building

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Intro

For many people who have had MCS for some time, they have slowly made their living space their sanctuary. For those who are newly diagnosed, things are going to be different, and need to be for you to stay as well as possible. That means looking at your home in a different light. This series of articles will walk through the kinds of elements that I look for in a healthy house, and where the potential problems lie within a home. We will focus on the sneaky things that you may have missed in your own process as well.

Basements

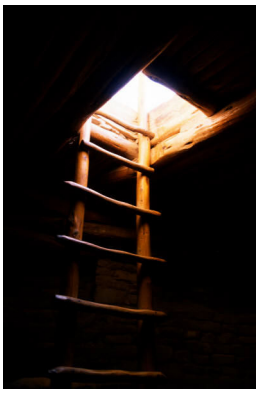
One of the silliest places that humans live is below ground. It's something we did way back in the days of us living in caves and hiding out from saber tooth tigers. Luckily we've gained some insights into life and living, like running away from tigers and other bad things that we come across, for example.

Unfortunately, the concept of living in caves has stuck with us as some primordial sense of safety. Basements are, however, far from that truth.

The history of basements is relatively simple. We started out with cold cellars where we stored our rutabagas in hopes that they would grow mould so we wouldn't have to eat them. That worked well since the cold room was cold, wet and full of moisture in the air. Next we found these new fangled furnace thingy's that ran on coal and we needed a place to store this stinky, sooty coal, so we figured the basement was best and it now became the coal cellar. Still the rutabagas grew mould even under the coal dust, and so the story continues. Next our houses became bigger again, and we needed a place to put the noisy kids, so we dug out the basement even farther and laid down some carpet and old furnishings, and tossed the kids into it. They still don't eat rutabagas and the basement is still cold, wet and full of moisture in the air. For those of you who have a dirt crawlspace under your home, go back a step and remove the coal furnace, and you are there in spades.

The challenge with this type of construction is that when you dig a hole somewhere it wants to fill up with water. This is amplified by a few different elements.

First, the relative humidity of soils typically is about 100% RH. This means that soil is really wet. Not always physically soggy or muddy, but the moisture content in the air spaces between the soils are very high, at maximum capacity.



Now everything in the universe wants to be at equilibrium, so if it's 100% RH on the outside of your basement wall, and 45% RH on the inside, the moisture wants to be equal, so there is a drive, a push a force that moves the water from the soil to your basement. This is called diffusion. Think of an orange and how when someone peels it across the room you can smell it instantly. That's because the orange molecules want to be at equilibrium in the room, and spread out throughout the space. Ditto with the water on the other side of your basement wall, it wants to be at equilibrium and passes through the concrete, which can move water very easily because it is very hygroscopic.

Hygroscopicity is the ability of a material to suck up moisture in a liquid or vapor state. Concrete is really good at that. It is filled with little tiny tubes inside the concrete and they are called capillaries, like veins so to speak. These capillaries can suck up water because the water molecules bond to the walls of the capillaries. There is enough capillary action to pull water in concrete straight up to almost 1 kilometer (.62 miles) in the air! This is an incredible amount of suction power.

So, if you think that just because there is a little water in the corner of your basement, your wood structural members on top of your concrete wall are safe, think again. It is very important that these are separated from each other with some sort of gasket, because that water is always present, and always moving through the concrete. Typically anything newer than 1970's construction has some form of gasket between the concrete bits and the woody bits. I've seen it earlier from good quality construction, but it's rarer.

The other challenge with basements is the leakage of air into them from the outside. We all know that hot air rises and cold air falls, right? Well the outside air in the summer is pretty hot, and your basement is pretty cold, in comparison. It's colder due to the earth's relatively stable temperature, which keeps the basement cooler than upstairs.

The air that is being blown around by wind and it's pressure outside hits the walls of your house on the windward side, and is sucked into your basement. This happens because the two temperatures, just like the moisture content in the air, want to be at equilibrium. So, the hot air wants to heat your basement, and the house's stack effect pulls it in, which is the ability of the house to act like a chimney.

Since the cold air is more dense that hot air (hot air expands and becomes buoyant), the air in the basement is under negative pressure or to put it another way, the air in this space is being sucked into the house, while the air at the top of the hot house (that acts like a chimney) is positively pressurized and is trying desperately trying to escape out the top and leeward side through cracks and holes. The amount of air escaping is equal to the amount of air being pulled in at the bottom and windward side.

Most of us are concerned about the energy efficiency side of things, but this is also a major air quality issue, as the air is coming through cracks in the walls, floors, joints and other places that no one cleans. This means the air is dirty, dusty, and potentially moldy coming into the space, which is then just warmed up and moved through the house. If that doesn't sound good for you, it isn't.

We have two different forces acting upon the basement. We have the moisture drive from the soil, which is coming at us from the walls and from the floor. The walls are mostly from precipitation working it's way into the soil and then into the walls, while the floor moisture source is typically from the water table below us rising up, as it is a dynamic stream of water moving and changing. Both sources add moisture to the basement that can negatively impact the space.

Secondly we have the air being drawn into the basement through the leaks, cracks and holes that is dirty and unfiltered, creating now poor air quality, with potential moulds in the air, and mixed up with some moisture from the soils around us.

Finally all we do is add some carpets (sponges) and some old furniture (dusty, dirty, and breaking down chemicals) into the mix, stir it up with some high energy kids, and we have all the fixin's for some really poor air quality.

In the next article we will talk about how to make the basement as healthy as possible. Now that we understand the science of what is going on, it's significantly easier to take control and improve the situation as best as possible.

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